PATENT

Docket 017

Title

METHOD OF MANAGING WORK ORDERS AT A WELL SITE

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Background of the Invention

Field of the Invention

The invention generally pertains to service work performed at a well site and more specifically pertains to a method of managing such work.

Description of Related Art

After a well is set up and operating to draw petroleum, water or other fluid up from within the ground, various service operations are periodically performed to maintain the well. Such service operations may include replacing worn parts such as a pump, sucker rods, inner tubing, and packer glands; pumping chemical treatments or hot oil down into the well bore; and pumping cement into the well bore to partially close off a portion of the well (or to shut it down entirely). Since wells are often miles apart from each other, the maintenance or service operations are usually performed by a mobile unit or service vehicle having special onboard servicing equipment suited to perform the work. Some examples of service vehicles include a chemical tank truck or trailer, a cement truck or trailer, a hot-oiler tank truck or trailer, and a portable work-over service rig having a hoist to remove and install well components (e.g., sucker rods, tubing, etc.).

Service vehicles are often owned by independent contractors that the well owner or well operator hire to service the wells. When a well needs servicing, the process of actually getting the work done and accurately documenting that fact can be quite involved. Typically, a representative of the company that owns and/or operates the well determines what service operations are needed. After consulting with various contactors, the company representative prepares a work order that specifies what work is to be performed and at what price. The representative typically mails the work order to the representative's chosen contractor. The contractor, in turn, dispatches a crew to the well site to perform the work. However, if the actual work order remains at the contractor's office, the crew cannot readily refer back to the order as the work is being performed, which can lead to errors. Once a job or specific service operation is completed, the crew

returns to the contractor's office to report the completion of their assignment. To receive payment for the work, the contractor typically submits an invoice to the accounts payable department of the well company. However, personnel in accounting may have no idea of whether the work has actually been performed satisfactorily. Thus, payment of the invoice may be delayed until after those in accounting acquire verification that the work has been completed as specified in the original work order. The whole process becomes even more complicated when a particular well servicing project involves numerous work orders that are assigned to several different independent contractors.

Consequently, there is a need for a more efficient and accurate method of managing work orders that well companies issue to independent contractors that work at remote well sites.

Summary of the Invention

To avoid the problems and limitation of current methods of managing well-related work orders, it is an object of the invention to provide an electronic copy of a work order directly at the well site at which service operations are being performed on a well.

A second object of the invention is to allow multiple independent contractors access to several work orders by way of a computer carried by a service vehicle of one of the contractors.

A third object of the invention is to provide a wireless communication link between one computer at a home base location and another computer at a remote well site, wherein well-related work order information can be exchanged between the two computers.

A fourth object is to allow a company representative at a home base computer to acknowledge the completion of a service operation performed by an independent contractor at a remote well site.

A fifth object is to provide a method of effectively managing work orders that pertain to pumping, manipulating sucker rods, manipulating tubing, perforating a well pipe, and/or downhole logging.

A sixth object is enter into a computer a well site identifier that allows a contractor at the well site to access the appropriate work order for the particular well being serviced.

A seventh object is to allow a representative of the well company to enter an input into a computer to indicate that the representative accepts the work done by a contractor.

These and other objects of the invention are provided by a method of managing work orders by storing a work order on a home base computer, and then conveying the work order over a wireless communication link to another computer that a service vehicle carries to at a remote well site.

Brief Description of the Drawings

Figure 1 is a schematic diagram illustrating a method of managing work orders according to a currently preferred embodiment of the invention.

Description of the Preferred Embodiment

Service operations to be performed by a contractor 10 on a well 12 at a well site 15 can be managed from a remote location 14 by using a method 16 illustrated in Figure 1. Well 12 is schematically illustrated to encompass any apparatus for drawing a fluid (e.g., oil, gas, water, etc.) from the ground. In some embodiments of the invention, well 12 includes a string of outer piping known as casing 18. When perforated, casing 18 provides a conduit that conveys fluid from within the ground to the inlet of a submerged reciprocating pump 20. An inner string of pipe, known as tubing 22, provides a discharge conduit that conveys the fluid from the outlet of pump 20 to the surface. A powered pivoting beam (not shown) moves a string of sucker rods 24 up and down, which in turn moves the pump's piston up and down to pump the fluid.

Any work done to well 12 is referred to as a service operation. Examples of service operations include, but are not limited to manipulating sucker rods (e.g., installing,

torquing, or replacing rods 24, as indicated by arrow 26); manipulating tubing (e.g., installing, torquing, or replacing tubing 22, as indicated by arrow 28); perforating casing 18, as indicated by a perforating gun 30 suspended from a cable or wireline 32; down hole logging, as indicated by a transducer 34 suspended from a wireline 36; pumping a fluid 38 (e.g., cement, acid, steam, hot oil, etc.) into well 12, as indicated by pump 40 and arrow 42; welding; fracture treatments; drilling; stimulating; swabbing; bailing; testing; and various other work that is familiar to those skilled in the art.

Owners, operators, and/or well managers (all of which are referred to herein and below as company 44) of well 12 may pay various contractors, such as contractors 10 and 46, to perform service operations on well 12. Method 16 is especially useful in coordinating the efforts of independent contractors, such as when contractors 10 and 46 are not employees of company 44, and/or when one contractor is not an employee of the other.

To specify what work needs to be done, company 44 may issue one or more work orders, such as work orders 48 and 50. Work order 48 may specify one or more service operations 52 intended for contractor 10, and work order 50 may specify one or more service operations 54 intended for contractor 46. In a preferred embodiment of the invention, company 44 stores work orders 48 and 50 on a home base computer 56 at location 14, which is remote relative to well site 15. The term, "computer" used herein and below refers to any device for storing and/or possessing digital information. Examples of a computer include, but are not limited to items known as personal computers, PC, desktop computer, laptop, notebook, PLC (programmable logic controller), data logger, etc. In some cases, the computer may run common software such as Microsoft Word, Excel, Access; Visual Basic; C++ etc. The term, "remote location relative to well site 15" means that the location is beyond the immediate property or land on which well 12 is contained or at least one-mile away from well 12, whichever is greater.

To communicate work orders 48 and 50 to contractors 10 and 46 at well site 15, contractor 10 uses a service vehicle 58 to transport (indicated by arrow 60) another computer 62 to well site 15. The term, "service vehicle" refers to any vehicle used to

facilitate performing one or more service operations on well 12. Examples of a service vehicle include, but are not limited to, mobile work-over unit 58 and a tanker 64. Work-over unit 58 includes a variety of equipment including, but not limited to, rod tongs, tubing tongs, and a wireline winch and/or a hoist 66. Work-over unit 58 is particularly suited for removing or installing well components, such as sucker rods, tubing, etc.; lowering instruments into the well bore via a cable or wireline; and may even be used in actually drilling the well bore itself. Tanker 64 is schematically illustrated to encompass all other types of service vehicles including, but not limited to, pumping vehicles, such as a chemical tank truck or trailer, a cement truck or trailer, and a hot-oiler tank truck or trailer.

With computer 62 being at well site 15, work orders 48 and 50 can be communicated from computer 56 to computer 62 through a wireless communication link 68. The term "wireless communication link" refers to data being transmitted over a certain distance, wherein over that certain distance the data is transmitted through a medium of air and/or space rather than wires. Wireless communication link 68 is schematically illustrated to represent a wide variety of systems that are well known to those skilled in the art of wireless communication. For example, with a modem 70 and an antenna 72 associated with computer 56, and another modem 74 and an antenna 76 for computer 62, data pertaining to work orders 48 and 50 can be exchanged over the Internet between computers 56 and 62. The data can be in any of a variety of common formats including, but not limited to, HTML, e-mail, etc.

Work orders 48 and 50 having been communicated to computer 62 allows contractors 10 and 46 to review the work orders directly at well site 15. Once contractor 10 performs the service operation specified in work order 48, contractor 10 enters an input 78 into computer 62 that indicates that his service operation has been performed. Input 78 can be entered using any one of a variety of means including, but not limited to, a keyboard 80. Likewise, once contractor 46 performs the service operation specified in work order 50, contractor 46 enters an input 82 into computer 62 that indicates that her service operation has been performed. Information 84 and 86 that indicate that inputs 78 and 82 have been entered is then communicated from computer 62 to computer 56 using

wireless communication link 68. An example of information 84 and 86 would be a statement such as, "Service operation has been performed." Information 84 and 86 thus notifies company 44 that the service operations of work orders 48 and 50 have been performed, and feedback 88 is displayed on computer 62 to indicate that information 84 or 86 has been made available to computer 56. An example of feedback 88 would be a statement such as, "Completion of work order has been forwarded."

In some embodiments of the invention, company 44 may communicate from computer 56 to computer 62 an acknowledgement 90 that company 44 has actually received information 84 or 86 that indicating that a particular service operation has been performed.

To verify that contractor 10 has satisfactorily performed a service operation, a field representative 92 of company 44 may enter an input 94 (e.g., a password or confidential code) that indicates representative 92 accepts the work performed by contractor 10. Input 94 may then be used enable the communication of input 78, information 84, and/or acknowledgement 90.

In some versions of the invention, contactor 10 or 46 may enter a well site identifier 96 into computer 62 by using keyboard 80 and/or selecting from a menu of well site identifiers stored in computer 62. Well site identifier 96 could be some alphanumeric value that identifies the well by a name or address. This could allow a contractor access to the appropriate work orders for a particular well.

Although the invention is described with reference to a preferred embodiment, it should be appreciated by those skilled in the art that various modifications are well within the scope of the invention. Therefore, the scope of the invention is to be determined by reference to the claims that follow.

I claim: